DENVER
THE MILE HIGH CITY

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SUMMARY OF HISTORICAL SUBSURFACE INVESTIGATIONS ASSOCIATED WITH THE HIGH STREET OUTFALL AND 40TH AVE. STORM SEWER SYSTEM

Purpose and Scope

The City and County of Denver (City) is planning storm sewer and outfall improvements in the area around the Denver Coliseum (Project). The Project area is located within the Vasquez Boulevard and Interstate 70 (VB/I70) Superfund Site and bisects a historical landfill and train yard. The area has been the subject of several subsurface investigations to identify environmental concerns such as contaminated soil or groundwater that could require special handling for worker safety during excavation or offsite disposal. Department of Environmental Health – Division of Environmental Quality (EQ) has compiled the results of several investigations into this summary document. See Figure 1 for the location of the Project.

This summary of historical investigations has been developed for the Project to assist field operations in identifying where potentially contaminated soil and groundwater may be located and to allow the contractor to more accurately bid the project.

Potential Environmental Concerns

The project area has been impacted by historical landfill activities and is also within the footprint of the VB/I-70 Superfund Site.

Historical Information

The landfill is located under a large portion of the Coliseum parking lot and is evident by the undulating pavement. When the landfill was operating, it is known to have accepted construction and demolition debris along with some residential and commercial trash. Historical investigations in the area confirmed the existence of fill material, as well as the presence of asbestos and methane gas.

Part of the project area is also within Operable Units (OU) 1 and 2 of the VB/I-70 Superfund Site. Surface soils inside these OUs could be impacted with elevated levels of lead and arsenic from the presence of a historical smelter that operated from 1882 through 1903. Historical investigations in the area confirmed elevated levels of arsenic and lead above residential human health screening levels. An additional sampling effort as part of the OU2 remedial investigation (RI) was performed in 1998 to further identify the nature and extent of contamination. Sample results confirmed the historical findings.

As part of the OU2 RI, five groundwater wells were drilled and sampled quarterly for one year. Arsenic at concentrations above state and federal drinking water levels was found in one of the wells (MW-2) in the Coliseum parking lot.

The southern portion of the Project also bisects historical railroad tracks at a rail yard currently operated by Union Pacific. Railroad operations often involve the use of chemicals and contamination associated with normal railroad operations that are apt to be found anywhere along the line. Arsenic could be present in the soil from old railroad ties that were dipped in an arsenic solution, arsenic weed-control sprays, and arsenic-laced slag used as railroad bed fill. Lubricating oil and diesel that dripped from the trains are likely sources of petroleum hydrocarbons. Other sources of contaminants associated with historical and current railroad operation may include coal ash from engines, creosote from ties, poly-aromatic hydrocarbons (PAHs) from the diesel exhaust and unreported spills of all types.

Project Specific Investigations

Brown and Caldwell, April 2010

In April 2010, EQ contracted with Brown and Caldwell (B&C) to perform a Phase II Environmental Site Assessment (Phase II ESA) at the project area to identify the presence of environmental concerns that could impact project activities. The Phase II ESA field activities consisted of installing eight boreholes, screening soil for volatile organic compounds (VOCs); visual inspection of excavated soil and submission of select soil samples for laboratory analysis. Temporary groundwater wells were installed in each boring (with one exception) and samples submitted for laboratory analysis as well as samples from two of the historical RI wells.

Soil

The B&C Phase II ESA field screening did not to detect concentrations of VOCs in soil exceeding CDPHE Residential Colorado Soil Evaluation Values (CSEVs) although the project area was confirmed to encompass a historical fill area where subsurface debris consisting of wood, paper, brick and glass were encountered. Three soil samples contained the polyaromatic hydrocarbon (PAH) benzo(a)pyrene at concentrations exceeding Residential and Worker CSEVs.

Arsenic was detected above the CSEV in five locations, but all results were well below the EPA risk assessment background of 15 milligrams per kilogram (mg/kg)[1]. Two of the soil samples contained lead that exceeded 20 times the Toxicity Characteristic Leaching Procedure (TCLP)[2] but all were below the CSEV. The TCLP was performed on the two samples and neither result exceeded the limit; the soils can be disposed at a non-hazardous landfill.

[1] EPA, 2001 http://www.epa.gov/unix0008/r8risk/pdf/hhra_vbi70-ou1.pdf

[2] TCLP values are used to determine if a media is considered hazardous (40 CFR Part 261.24). If the total metals concentration is less than 20 times the TCLP value, it is unlikely that the media will need to be regulated as a hazardous waste and will not require special handling and disposal.

Soil staining and odor was observed in three of the soil borings; samples of which were then submitted for analysis of gasoline range organics (GRO), diesel range organics (DRO) and polychlorinated biphenyls (PCB). GRO and PCBs were not detected at concentrations exceeding their respective reporting limits. DRO was detected in each of the three samples but at concentrations less than the Colorado Department of Labor and Employment, Division of Oil and Public Safety (OPS) screening level of 500 mg/kg.

Asbestos containing material (ACM) was identified from one of the borings located in the landfill area (HS-02). The sample was collected from a boring where landfill debris was noted in the soil core. The soil was reported to have a concentration of 0.5 as a percent of the total sample analyzed.

Groundwater

Volatile organic compounds including chloroform, tetrachloroethene (PCE) and trichloroethene (TCE) were detected in groundwater at concentrations exceeding CDPHE Regulation 41 Basic Standards for Groundwater (CDPHE 41). Cadmium was also detected in groundwater at concentrations exceeding CDPHE 41 Regulations.

Landfill Gas

B&C analyzed landfill gas that had accumulated in soil borings drilled within the landfill area. The landfill gas was analyzed for methane and ranged in concentration from 0.0 percent to 56.7 percent of total soil gas.

Sample locations and analytical results are shown in Figure 2 (soil), Figure 3 (groundwater) and Figure 4 (methane in soil). Please note that the Figures are to be used only for sample location and sample results. Any apparent design element(s) should not be considered.

CTL-Thompson, March 2011

CTL-Thompson performed a geotechnical investigation in March 2011 with a concurrent Phase II ESA. Field activities consisted of installing six boreholes, screening soil for VOCs; visual inspection of excavated soil and submission of select soil samples for laboratory analysis. Temporary groundwater wells were installed in each boring and samples submitted for laboratory analysis.

Soil

There were no VOCs or SVOCs reported above Residential CSEVs.

Arsenic was reported in all samples, but again, results were not above background and below the CSEV. While two samples contained lead at greater than 20 times the TCLP value, the procedure was not performed as the B&C Phase II ESA showed the soil was determined to be non-hazardous. All lead results were below the CSEV.

Groundwater

Two groundwater samples from Globeville Landing Park exceeded the limits set by CDPHE 41 for PCE and TCE, and another sample exceeded the limit for PCE and cis-1,2-

dicholorethane. Additionally, arsenic, iron, manganese and cadmium were found in groundwater at levels that exceed CDPHE 41.

Asbestos
Asbestos samples were collected from three of the borings. No ACM was identified.

Methane
Methane was detected at levels exceeding the lower explosive limit in at least one sample, but the actual levels and locations were not provided.

Sample locations and analytical results are shown in Figure 5 (soil), Figure 6 (groundwater) and Figure 7 (CTL asbestos). Please note that the Figures are to be used only for sample location and sample results. Any apparent design element(s) should not be considered.

Conclusion

Based on results of the Phase II ESA the following environmental concerns could be present in the Project area:

- Landfill debris (including PAHs, asbestos) in soils;
- Methane in soil vapor from landfill area;
- Petroleum hydrocarbons in soil;
- Metals (arsenic and lead) in soil;
- Metals (arsenic and cadmium) in groundwater; and
- Chlorinated hydrocarbons in groundwater.

It is the responsibility of the contractor to follow all appropriate regulations, obtain the proper permits, and have the trained field personnel to identify potential contamination and asbestos. Specifically to address groundwater, the contractor would be required to obtain a "Groundwater Discharges Associated with Construction Activity Permit" from the state's Colorado Department of Public Health and Environment (CDPHE) before dewatering activities started.

Limitations

The limited scope of this environmental summary must be understood. Future regulatory changes, agency interpretations, and/or concepts of due diligence industry standards are beyond the control of EQ.

EQ's objective is to perform our work with care, exercising the customary skill and competence of Environmental Site Assessment professionals in the relevant disciplines. The opinions presented herein apply to subject property conditions existing at the time of our investigation and those reasonably foreseeable. EQ does not warrant or guarantee the subject property suitable for any particular use or purpose, or certify that the subject property is "clean".

As with any environmental concern, Denver's Department of Environmental Health, Environmental Quality Division is available to advise all city agencies and is pleased to be of

service. If you have any questions or concerns that you would like to discuss regarding this limited site summary, please telephone Lisa Farrell (720-865-5439).

REFERENCES[3]

Vasquez Boulevard, I-70 Superfund Site Operable Unit 2 Remedial Investigation, prepared by Engineering Support Management, Inc., dated December 16, 2009.

High Street Limited Subsurface Investigation, Prepared by Brown and Caldwell, dated May 28, 2010.

Geotechnical Investigation, 40th Street Outfall Reaches 1 and 2, Northwest of 40th Street and Blake Street to Globeville Landing Park, Denver, Colorado, Prepared by CTL-Thompson, dated July 27, 2010.

Limited Phase II Environmental Site Assessment, 40th Street Outfall, South Platte River to Blake St., Denver, CO, prepared by CTL-Thompson, date May 10, 2011.

[3] All referenced documents are available as public record at the City and County of Denver, Department of Environmental Health, Environmental Quality Division.